

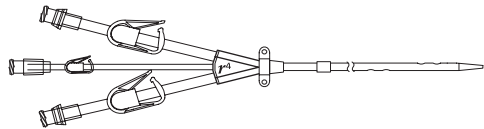


PHEROICIOUS™ 3-LUMEN APHERESIS CATHETER

INSTRUCTIONS FOR USE

PRODUCT DESCRIPTION

r4 Vascular has made its Pheroicious™ 3-Lumen Long-Term Central Venous Catheter of specially developed and processed radiopaque polyurethane. The catheters include female luer locking adapters and a tissue ingrowth cuff for fixing the catheters in a subcutaneous tunnel. r4 Vascular packages each catheter in a 2x sterile barrier package.



PLACEMENT:

Place the catheter into one of the jugular veins or subclavian vein so the tip lies in the superior vena cava above the right atrium. Tunnel subcutaneously to the preferred exit site. Position the tissue ingrowth cuff, affixed to the catheter, 3-5 centimeters below the skin exit site in the tunnel. The cuff promotes tissue ingrowth to secure the catheter in place.

Size	10.5 Fr	12.5 Fr
Red Lumen	15 Ga	12 Ga
Blue Lumen	16 Ga	15 Ga
Purple Lumen	17 Ga	17 Ga

USE OF LUMENS:

Use the distal lumen, as signaled by the purple tube, for power injection. Use a proximal lumen, as marked by the red and blue connectors, for blood products.

INDICATIONS FOR USE

The r4 Pheroicious™ apheresis triple lumen catheter is designed for short and long term (>30 days) apheresis, intravenous infusion, blood sampling and CECT via the jugular veins or subclavian vein. The maximum recommended flow rate is 5 ml/sec for power injection of contrast media. The maximum pressure of the power injector utilized should not exceed 300 psi.

CONTRAINDICATIONS AND WARNINGS

Before placing this device, ensure you are educated regarding this catheter's indications, contraindications, proper procedures for insertion and maintenance, and appropriate infection-control measures to prevent catheter related infections.

CONTRAINDICATIONS

- r4 contraindicates its Pheroicious™ catheter whenever:
 - Infection, bacteremia, or septicemia may be present.
 - The patient's body size is inadequate to allow the size of the implant.
 - The patient may be allergic to the catheter.
 - Severe chronic obstructive lung disease exists. (percutaneous subclavian placement only)
 - The insertion site has been irradiated.
 - Previous episodes of venous thrombosis or vascular surgical procedures at the placement site.
 - Local tissue will prevent proper stabilization or access.

WARNINGS:

- When using alcohol or alcohol containing antiseptics with polyurethane catheters, take care to avoid prolonged or excessive contact. Allow solutions to dry before applying an occlusive dressing. Chlorhexidine gluconate or povidone iodine are the suggested antiseptics to use.
- Do not use alcohol to soak or decontaminate polyurethane catheters because alcohol degrades polyurethane catheters with repeated and prolonged exposure. Do not use acetone and PEG-containing ointments as they can cause polyurethane catheters to fail. Chlorhexidine patches are the preferred alternative.
- Cardiac arrhythmias may result if the guidewire passes into the right atrium.
- Close all clamps only in the center of the extension legs.
- Extensions may develop cuts or tears if subjected to excessive pulling or contact with rough edges. Repeated clamping near or on the luer lock connectors may cause tubing fatigue and possible disconnection.
- Implant catheters carefully to avoid any sharp or acute angles which could compromise the catheter lumens.
- To prevent air embolism or blood loss, place thumb over the sheath introducer opening.
- To avoid damage to vessels and viscous, infusion pressures should not exceed 25 psi (172 kPa). R4 recommends the use of a 10 ml or larger syringe because smaller syringes produce more pressure than larger syringes.

Note: A three-pound (13.3 Newton) force on the plunger of a 3 ml syringe produces more than 30 psi (206 kPa). The same three pound (13.3 Newton) force on the plunger of a 10 ml syringe produces less than 15 psi (103 kPa).

- Accessories and items used with this catheter should incorporate luer-lock adapters.
- When using heparin, aspirate it out of all lumens immediately before using the catheter to prevent systemic heparinization of the patient.
- Failure to clamp extensions when not in use may lead to air embolism.
- In the rare event of a leak, clamp the catheter immediately. Take any necessary remedial action before resuming the infusion procedure.
- Do not resterilize the catheter or parts by any method. The manufacturer will not be liable for any damages caused by reuse of the catheter or accessories.
- Ensure the solution is dry before applying an occlusive dressing.
- Percutaneously insert the catheter into the axillary-subclavian vein at the junction of the outer and midthirds of the clavicle lateral to the thoracic outlet.
- Do not insert the catheter into the subclavian vein medially. Such placement may cause to compression of the catheter between the first rib and clavical. Compression can lead to damage or break and embolization of the catheter.
- Use fluoroscopic or radiographic to confirmation the catheter placement avoids the first rib and clavicle pinching the catheter.

SIGNS OF PINCH-OFF

CLINICAL:

- Difficulty with blood withdrawal
- Resistance to infusion of fluids
- Patient position changes needed for infusion of fluids or blood withdrawal

RADIOLOGIC:

- Grade 1 or 2 distortion on chest X-ray. Evaluate any pinching for degree of severity before explantation. Oversee patients showing any degree of catheter distortion diligently. Grade pinch-off with proper chest x-ray (see chart).

POWER INJECTION WARNINGS

- Only power inject through lumens labeled for such use. Otherwise the catheter may fail.
- Do not exceed a fluid flow rate of 5 ml/sec or a pressure of 300 psi when power injecting the catheter. Exceeding these maximum limits may result in catheter failure or catheter tip displacement.

GRADE PINCH-OFF WITH PROPER CHEST X-RAY AS FOLLOWS:

Grade	Severity	Recommended Action
0	No distortion.	No action.
1	Distortion present without luminal narrowing.	Take a chest x-ray every 1 to 3 months to survey progression of pinch-off to grade 2 distortion.
2	Distortion present with luminal narrowing.	Consider removing the catheter.
3	Catheter transection or break.	Remove catheter at once.

- Always ensure patency of the catheter before connecting the catheter to a power injector.
- Failure to warm contrast media to body temperature before power injection may result in catheter failure.
- The pressure limiting regulator of the power injector may not prevent over-pressurization of the catheter and lead to catheter rupture.

Note: The indication for power injection of contrast media implies the catheter's capacity to withstand the procedure but does not infer appropriateness of the procedure for a particular patient (r4 testing included 5 power injections). A suitably trained clinician is responsible for evaluating the health status of a patient as it applies to a power injection procedure.

PRECAUTIONS

Follow these precautions to help avoid catheter damage or patient injury:

- Only qualified healthcare practitioners should insert, manipulate and remove these catheters.
- Repeated over tightening of bloodlines, syringes and caps will reduce connector life and could lead to potential connector failure. In case of damage, clamp the catheter between the patient and the damaged area with a smooth-edged, atraumatic clamp.
- Only sterile and nonpyrogenic if packaging remains intact and without damage.
- Sterilized with Ethylene Oxide.
- Single Patient Use Only

CAUTION: Federal (USA) law restricts this catheter to sale by or on the order of a physician.

- Follow Universal Precautions when inserting and preserving the catheter.
- Follow all contraindications, warnings, cautions, precautions and instructions for all infusates as specified by its manufacturer.

Before beginning placement procedure, do the following:

- Examine package carefully before opening to confirm its integrity and the end date has not passed. The catheter comes in a 2x sterile barrier package and is nonpyrogenic. Only use product from sealed packaging, and only before end date. Sterilized by ethylene oxide. Do not resterilize.
- Inspect kit for inclusion of all items.
- Fill (prime) each lumen of the catheter with sterile heparinized saline or normal saline solution to help avoid air embolism.
- When using an introducer kit, verify the catheter fits easily through the introducer sheath.

To avoid catheter damage or patient injury during placement:

- Avoid accidental catheter contact with sharp instruments and mechanical damage to the catheter material. Use only smooth-edged atraumatic clamps or forceps.
- Avoid piercing, tearing or damaging the catheter
- Do not use the catheter if there is any evidence of mechanical damage or leaking.
- Avoid sharp or acute angles during implantation which could kink the catheter and impede flow.
- If securing the catheter with sutures, make sure they do not kink or damage the catheter.

When using percutaneous introducers:

- Carefully insert the introducer and catheter to avoid accidental penetration to structures in the thorax.
- To avoid blood vessel damage, do not allow the introducer sheath to remain in the blood vessel without the internal support of a catheter or dilator.
- Simultaneously advance the sheath and dilator with rotational motion to help prevent sheath damage.

CAUTION: If you must withdraw the guidewire, remove both the needle and wire as a unit. This reduces the risk of the needle damaging or shearing the guidewire.

CAUTION: Take care not to advance the introducer sheath too far into vessel as a potential kink would create an impasse to the catheter.

CAUTION: Ensure to only tear the introducer sheath externally. You may need to push the catheter further into the vessel while tearing the sheath.

CAUTION: For best product performance, do not insert any portion of the cuff into the vein.

After placement, note the following precautions to avoid catheter damage or patient injury:

- Do not use the catheter if there is any evidence of mechanical damage or leaking. Damage to the catheter may lead to rupture, fragmentation and possible embolism and surgical removal.
- Accessories and items used with this catheter should incorporate luer lock connections.
- Infusion pressure greater than 25 psi (172 kPa) may damage blood vessels and viscous. DO NOT USE A SYRINGE SMALLER THAN 10mL.

POSSIBLE COMPLICATIONS

The potential exists for serious complications including:

- Air Embolism
- Hydrothorax
- Bleeding, Inflammation, Necrosis or Scarring
- Brachial Plexus Injury
- Cardiac Arrhythmia
- Intolerance Reaction
- Cardiac Tamponade
- Catheter or Cuff Erosion
- Laceration of Vessels or Viscous
- Perforation of Vessels or Viscous
- Catheter Embolism
- Pneumothorax
- Catheter or Cuff Occlusion
- Spontaneous Catheter Tip Malposition or Retraction
- Pinch-Off
- Thoracic Duct Injury
- Thromboembolism
- Venous Thrombosis
- Catheter-related Sepsis
- Ventricular Thrombosis
- Endocarditis
- Vessel Erosion
- Exit Site Infection
- Exit Site Necrosis
- Local and General Anesthesia risks
- Extravasation
- Fibrin Sheath Formation
- Hematoma
- Hemothorax

Before inserting any central venous catheter, ensure that you are familiar with complications and their emergency treatment should any of them occur. Only people knowledgeable of the risks involved, and qualified in the proper procedures should place and preserve central venous catheters.

CATHETER PLACEMENT PROCEDURE

INSERTION TECHNIQUE (1) PERCUTANEOUS PLACEMENT USING A SPLIT SHEATH INTRODUCER:

A (COMMON STEPS).

INSERT CATHETERS UNDER STRICT ASEPTIC CONDITIONS.

- Provide a sterile field throughout the procedure. Use maximal barrier compliance. The operator placing the central line and those aiding in the procedure should strictly comply with hand hygiene (either by washing hands with conventional antiseptic-containing soap and water or with waterless alcohol-based gels or foams) and wear a cap, mask, sterile gown, and sterile gloves. The cap should cover all hair and the mask should cover the nose and mouth tightly. The patient should also wear a mask and should be covered from head to toe with a sterile drape, with a small opening for the site of insertion.
- Prepare skin preferably with antiseptic chlorhexidine 2% in 70% isopropyl alcohol. Although a 2% chlorhexidine-based preparation is preferred, tincture of iodine, an iodophor, or 70% alcohol can be used. Pinch wings on the chlorhexidine applicator to break open the ampule (when ampule is included). Hold the applicator down to allow the solution to saturate the pad. Press sponge against skin, and apply chlorhexidine solution using a back-and-forth friction scrub for at least 30 seconds. Do not wipe or blot. Allow antiseptic solution time to dry completely before puncturing the site (~ 2 minutes).
- (If applicable) Administer local anaesthesia to the insertion site and the path for subcutaneous tunnel.
- Flush each lumen with normal saline before insertion and clamp the extension legs.
- Insert the introducer needle with an attached syringe to the wanted location. Aspirate gently while inserting.
- After entering the vein, remove the syringe leaving the needle in place.
- If using a micro-introducer kits, insert the flexible end of the guidewire into the needle. Advance the guidewire as far as suitable. Verify correct positioning, using fluoroscopy or ultrasound.
- Gently withdraw and remove the needle, while holding the guidewire in position.

CAUTION: If you must withdraw the guidewire, remove both the needle and wire as a unit. This reduces the risk of the needle damaging or shearing the guidewire.

- Advance the small sheath and dilator together as a unit over the guidewire, using a slight rotational motion. Advance the unit into the vein as far as suitable.
- Withdraw the dilator and guidewire, leaving the small sheath in place.

WARNING: To prevent air embolism or blood loss, place thumb over the sheath introducer opening.

- Insert the tip of the guidewire through the introducer needle into the vessel. Advance the guidewire to the needed location in the vessel.
- If using a microintroducer, gently withdraw and remove the small sheath, while holding the standard guidewire in position.

- Remove the needle while holding the guidewire in place. Wipe the guidewire clean and secure it in place.

CAUTION: If you must withdraw the guidewire, remove both the needle and wire as a unit. This reduces the risk of the needle damaging or shearing the guidewire.

- Make a small incision at the insertion site. Make a second incision at the desired exit site of the catheter.

- Go to common steps (B).

B (COMMON STEPS)

- Flush catheter before placement
- With a tunneler, create a subcutaneous tunnel from the catheter exit site to emerge at the venous entry site. Attach the catheter to the tunneler so the catheter's distal tip slides over the barbed connection and rests next to the sheath stop. This allows the catheter to thread through the tissue when creating the tunnel. Slide the sheath found on the tunneler over the catheter's distal tip and ensure the sheath is covering the tip. This will reduce the drag on the proximal tip in the skin tunnel. After positioning cuff, remove the tunneler by sliding sheath away from the catheter and pulling tunneler from distal tip. Do not force the catheter through the tunnel.
- Position the white retention cuff roughly midway between the skin exit site and the venous entry site, about 2 cm minimum from the venous entry site.

C (PERCUTANEOUS PLACEMENT)

- Fill the catheter lumens with normal saline or heparinized saline.
- Advance the dilator sheath introducer assembly over the guidewire into the vessel.

WARNING: Cardiac arrhythmias may result if the guidewire passes into the right atrium.

- Withdraw the vessel dilator and guidewire, leaving the introducer sheath in place if placement will not be over the guidewire. If placing the catheter over the guidewire, remove the vessel dilator and leave the guidewire in place.

CAUTION: Take care not to advance the introducer sheath too far into vessel. Kinking the sheath can create an impasse to the catheter.

WARNING: To prevent air embolism and blood loss, place thumb over the sheath introducer opening.

- Remove thumb and feed distal section of catheter into the sheath introducer and over the guidewire if still in place. Advance the catheter tip to the junction of the superior vena cava and right atrium.
- With the catheter advanced, remove the guidewire and peel away the sheath by gripping the "T" handle. Break it apart with a downward and outward motion to cause separation and withdrawal of the sheath.

CAUTION: You may need to push the catheter further into the vessel while tearing the sheath.

CAUTION: For best product performance, do not insert any portion of the cuff into the vein.

- D (Common Steps).

D (COMMON STEPS)

- To check catheter patency attach a 10ml syringe with sterile normal saline to each lumen of the catheter. Release the catheter clamp and aspirate blood through each lumen. Once flow is satisfactory, flush both lumens with heparinized saline in amounts equal to the priming volume of each lumen. Clamp each lumen immediately.

WARNING: Failure to clamp can lead to air embolism.

- For added security, suture the entry site, or use a StatLock™ catheter to anchor the catheter.
- Manage the exit site according to your institution's protocol.
- Dress the catheter.

WARNING: Acetone and PEG-containing ointments can cause failure of this catheter. Do not use them with polyurethane catheters. Chlorhexidine patches are the preferred alternative.

- Verify the catheter and tip location with x-ray or fluoroscopy.

INSERTION TECHNIQUE (2) SURGICAL CUTDOWN PROCEDURE:

Insert the catheter into the superior vena cava by the subclavian vein, external jugular vein or the internal jugular vein. For surgical cutdown procedure, place the patient in Trendelenburg position with the head turned to the opposite side of the entry site.

1. Go to A (Common Steps).
2. Create a small incision in the vessel at the intended site of catheter insertion

NOTE: If performing a jugular insertion and external vein is not of acceptable size to allow the catheter, use the internal vein instead. Use a purse string suture to secure catheter in the internal vein if suitable.

3. Make a small incision at the desired exit site of the catheter, in the area between the nipple and right sternal border. Make the incision just large enough to allow the implantable cuff.
4. Go to B (Common Steps).
5. Insert the catheter through a small venotomy in the selected vein. Advance the catheter tip to the junction of the superior vena cava and right atrium. Orient the distal lumen (blue clamp), cephalad.

CAUTION: For best product performance, do not insert any portion of the cuff into the vein.

6. Go to D (Common Steps)

RECOMMENDED DRESSING TECHNIQUE

1. Strictly comply with proper aseptic technique, especially hand hygiene.
2. Secure the catheter to the skin using 1 or 2 sterile tape strips.

Optional: Place a precut gauze dressing over the exit site, fitting it snugly around the catheter. Place a 2 x 2 in. (5 x 5 cm) gauze over the precut gauze and catheter.

3. Apply a cover dressing:

3a. Cut a 1-2 inch (3 - 5 cm) slit in the short side of an occlusive dressing using sterile scissors.

Remove the backing sheet.

3b. Viewing catheter site through the dressing on the skin so the slit is over the catheter hub. Press one side of dressing into place while holding the other side off the skin.

3c. Partially remove the frame portion of the dressing near the catheter hub.

3d. Overlap the unsecured side of the dressing slightly over the secured side to seal dressing under catheter hub. Carefully remove the frame from the dressing while firmly smoothing down the edges. Smooth down the entire dressing.

Do not use any acetone or PEG containing ointments in either the exit site care or in the catheter extension leg dressing. Use chlorhexidine patches instead.

STATLOCK™ CATHETER STABILIZATION PROCEDURE

1. Secure catheter with StatLock™ catheter stabilization catheter.
2. Cover site and StatLock™ catheter stabilization catheter with transparent dressing.
3. Place 1st anchor tape sticky side up, under one extension leg. Wedge tape between hub and wings. Chevron anchor tape on top of transparent dressing.
4. For multilumen catheters, place more anchor tapes sticky side up under remaining hubs. Wedge tape between hubs and wings.
5. Chevron anchor tape on top of transparent dressing.

TAPE STRIP SECUREMENT PROCEDURE

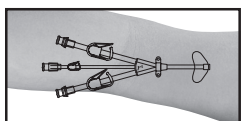
1. Place 1st anchor tape over wings or hub.
2. Cover site and 1st anchor tape with transparent dressing up to hub, but not over hub.
3. Place 2nd anchor tape sticky side up under one hub and close to transparent dressing. Wedge tape between hub and wings.
4. Chevron anchor tape on top of transparent dressing.
5. Optional: For multilumen catheters, place more anchor tapes sticky side up under remaining hubs. Wedge tape between hubs and wings. Chevron anchor tape on top of transparent dressing.

CAUTION: Secure the catheter in place to reduce the risk of catheter breakage and embolization.

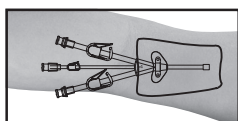
WARNING: When using alcohol or alcohol containing antiseptics with polyurethane catheter, take care to avoid prolonged or excessive contact. Allow solutions to dry before applying an occlusive dressing. Chlorhexidine gluconate or povidone iodine are the suggested antiseptics to use.

WARNING: Do not use alcohol to lock, soak or declot polyurethane catheter because alcohol degrades polyurethane catheters with repeated and prolonged exposure.

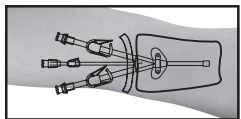
WARNING: Do not wipe the catheter with acetone based solutions or polyethylene glycol containing ointments. These can damage the polyurethane



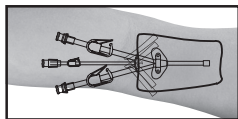
1. Secure catheter with the StatLock™ stabilization device.



2. Cover site and the StatLock™ stabilization device with transparent dressing.



3. Place first anchor tape sticky side up, under one extension leg. Wedge tape between hub and wings. Chevron anchor tape on top of transparent dressing.



4. Place second anchor tape sticky side up under hub. Wedge tape between hub and wings. Chevron anchor tape on top of transparent dressing.

material over time.

POWER INJECTION PROCEDURE

WARNING: This catheter's indication for power injection of contrast media implies the catheter's capacity to withstand the procedure. It does not infer appropriateness of the procedure for a particular patient. A suitably trained clinician is responsible for evaluating the health status of a patient as it applies to a power injection procedure.

- a. Use suitable imaging techniques such as a chest x-ray to position the catheter tip in the patient's superior vena cava.
- b. Remove the injection cap from the catheter.
- c. Attach a 10 ml or larger syringe filled with sterile normal saline.
- d. Aspirate for satisfactory blood return and vigorously flush the catheter with the full 10 ml of sterile normal saline. Do not power inject if blood return is unsatisfactory.

WARNING: Failure to ensure patency of the catheter before power injection studies may result in catheter failure.

- e. Detach syringe.
- f. Attach the power injector to the catheter according to manufacturer's recommendations.
- g. Warm contrast media to body temperature before power injecting.

WARNING: Failure to warm contrast media to body temperature before power

injection may result in catheter failure.

- h. Use only lumens identified as power injectable for power injection of contrast media.

WARNING: Use of lumens not identified as power injectable, for power injection of contrast media may cause failure of the catheter.

- i. Complete power injection study taking care not to exceed the flow rate limits. Do not exceed the maximum flow rate of 5 ml/sec.

WARNING: Do not exceed the maximum flow rate of 5 ml/sec, or the maximum power injector pressure setting of 300 psi. Doing so may result in catheter failure or catheter tip displacement.

WARNING: Power injector machine pressure limiting feature may not prevent over-pressurization of an occluded catheter, which may cause catheter failure.

- j. Disconnect the power injector.

- k. Replace the injection cap on the catheter.

- l. Flush the catheter with 10 ml of sterile normal saline, using a 10 ml or larger syringe. Lock each lumen with heparinized saline or citrate.

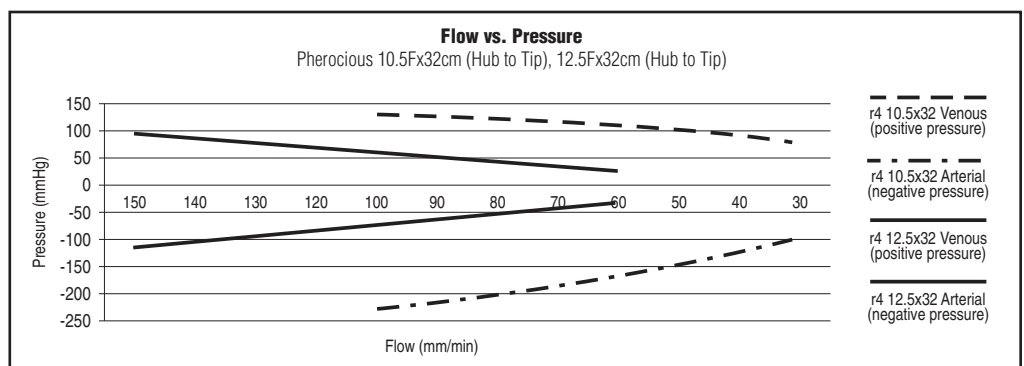


SUGGESTED CATHETER MAINTENANCE

1. Povidone iodine, dilute aqueous sodium hypochlorite solution, chlorhexidine gluconate 4%, or chlorhexidine gluconate 2% solution are the suggested antiseptics to use.

WARNING: Do not use acetone and PEG-containing ointments with polyurethane catheters. They can cause catheter failure. Chlorhexidine patches are the preferred alternative.

2. The care and maintenance of the catheter needs well trained, skilled personnel following a detailed protocol. The protocol should include a directive not to use the catheter for any purpose other than the prescribed therapy.
3. Monitor the catheter sites visually or by palpation through the intact dressing on a regular basis, depending on the clinical situation of individual patients. Always follow aseptic technique for these procedures.
4. If patients have tenderness at the insertion site, fever without obvious source, or other manifestations suggesting local or BSI, the dressing should be removed to allow thorough examination of the site. Notify physician



Power Injection Information

Catheter Fr Size	Maximum Indicated Power Injection flow-Rate (ml/sec)	Average Maximum Catheter Pressure During Maximum Indicated Power Injection Flow Rate (psi)*	Average Max Burst Pressure (psi) **	Range of Max Burst Pressure (psi)
10.5 Fr	5 ml/sec	97 psi	244 psi	233 to 315 psi
12.5 Fr	5 ml/sec	95 psi	244 psi	233 to 315 psi

* Injector pressure set at a maximum of 300 psi

** 10.5Fr and 12.5Fr Apheresis catheter have the same ID, same wall thickness and material properties. Therefore the burst pressure and data is the same for both French sizes.

immediately if signs of infection are present.

5. Clean the exit site with an antimicrobial solution following your institution's protocol. Clean from the catheter working outward in a circular motion.
6. Dress the catheter as under "D (Common Steps)."

TROUBLESHOOTING

PATIENT WITH FEVER

Unusual signs or symptoms (that is fever, chills) occurring immediately following the procedure may suggest septic thrombosis. If this does result, remove the catheter.

INADEQUATE FLOW

Do not use excessive force to flush an obstructed lumen. Inadequate blood flow may result from an occluded lumen resulting from a clot or by contacting the wall of the vein. If manipulation of the catheter or reversing lumens does not help, then the physician may try to dissolve the clot with a thrombolytic agent (that is TPA). Physician discretion advised.

CATHETER EXCHANGE

It may become necessary to exchange the indwelling catheter because of infection or a persistent rise in pressures or decrease of flow rates if other troubleshooting measures are unsuccessful.

FLUSHING AND LOCKING THE CATHETER

PROCEDURE

Supplies you will need:

- Alcohol or povidone iodine wipe.
- 10 ml syringe with attached 1 inch (2.5 cm) needle filled with 2.5 ml of heparinized saline or citrate.
- Tape

The steps in the procedure are:

1. Collect your supplies in a convenient place.
2. Strictly comply with hand hygiene and wear a cap, mask, sterile gown, and sterile gloves. The cap should cover all hair and the mask should cover the nose and mouth tightly. The patient should also wear a mask and be covered with a sterile drape.
3. Remove the tape that is around the injection cap.
4. Clean the cap with an alcohol or povidone iodine wipe. If you use the iodine wipe, allow the cap to air-dry for two minutes – be sure not to touch the cap during this time. Do not blow on the area or allow the clean cap to dangle since this increases the chance of contamination of the area with germs.
5. Remove the needle cover and carefully insert the needle into the center of the catheter injection cap.
6. Release the clamp.
7. Inject heparin or citrate into the catheter. As you inject the last 0.5 ml of solution, withdraw the needle from the injection cap. If flushing the catheter of a small patient, do not flush too rapidly. A small patient's circulatory system may be sensitive to rapid changes in volume and pressure.

8. Remove the needle from the injection cap. Discard the syringe and needle in a biohazard container.
9. Retape the cap as outlined in the injection cap change procedure. Use a separate syringe to flush each lumen with sterile saline.

CHANGING THE CATHETER CAP

Supplies you will need:

- Sterile injection cap.
- Tape
- Catheter clamp
- Chlorhexidine or povidone iodine wipe.

The procedure to change the cap:

- Strictly comply with hand hygiene and wear a cap, mask, sterile gown, and sterile gloves. The cap should cover all hair and the mask should cover the nose and mouth tightly. The patient should also wear a mask and be covered with a sterile drape. Disinfect catheter hubs, needleless connectors, and luer connectors before accessing the catheter.
- Open the package of the new injection cap and prepare according to your instructions. Be sure the cap does not touch the outer surface of the package. Note you may need to prefill the injection cap with normal saline or heparin or citrate if it is a long cap with significant airspace.
- Remove the old tape from around the cap by unpeeling the tape. NEVER try to cut the tape with scissors as you may damage the catheter.
- Using an alcohol or povidone iodine wipe, clean around the place where the cap connects to the catheter. Allow to air-dry.
- While holding the catheter connector below the heart, unscrew the old cap and discard. (The fluid level in the catheter should drop partway into the catheter if you hold the connector above the heart.)
- Pick up the new cap only by the top and remove the sterile tip protector. Attach the new cap by firmly screwing it onto the catheter connector.
- Cut a 5 cm piece of tape and make tabs on each end by folding back 1 cm. Apply the sticky part of the tape around the cap and catheter connection and fasten securely.
- Press ends of the tape together. The tabs on the end of the tape will enable you to remove it easily.

CATHETER REMOVAL

- The white retention cuff promotes tissue in-growth. Remove the catheter surgically, by freeing the cuff from the tissue and pulling the catheter gently and smoothly.
- After use, the catheter and accessories may be a potential biohazard. Handle and dispose of under accepted medical practice and all applicable laws and rules.

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